
Jeff Terry

MR-CAT
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Advanced Photon Source / Argonne National Laboratory
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Education

Ph.D. Chemical Physics 1997	<i>Stanford University</i> Department of Chemistry Stanford CA 94305
B.S. Chemistry 1990	<i>University of Chicago</i> Department of Chemistry Chicago IL 60637

Work Experience

Adjunct Assistant Professor 10/01 to present	<i>University of Notre Dame</i> Department of Physics Notre Dame IN 46556
Senior Research Associate Adjunct Assistant Professor 8/00 to present	<i>Illinois Institute of Technology</i> MR-CAT / Department of Biological, Chemical, and Physical Sciences Argonne IL 60439
Joint Staff Appointment 08/01 to present	<i>Argonne National Laboratory</i> Chemical Technologies Division Argonne IL 60439
Staff Scientist 11/98 to 7/00	<i>Los Alamos National Laboratory</i> Materials Characterization Team Nuclear Materials and Technology Division Los Alamos NM 87545
Research Associate 9/97 to 11/98	<i>Los Alamos National Laboratory</i> Materials Characterization Team Nuclear Materials and Technology Division Los Alamos NM 87545
Research Associate 12/96 to 9/97	<i>Northwestern University</i> Department of Materials Science and Engineering Evanston IL 60208
Co-term Research Associate 06/97 to 9/97	<i>Argonne National Laboratory</i> Materials Science Division Argonne IL 60439

Research Experience

MR-CAT
8/00 to present

X-Ray Absorption Spectroscopy, X-ray Scattering, X-ray Diffraction

A.) Applied the above techniques to investigate the electronic and geometric structure of molecular magnets: Determining the electronic and geometric structure of manganese ions in Mn_{12} Acetate.

B.) Applied the above techniques to determine the role of Cu impurities in the function of CdTe photovoltaic cells.

Los Alamos National Laboratory
Staff Scientist
11/98 to 7/00

Photoelectron Spectroscopy, Photoelectron Diffraction, X-Ray Absorption Spectroscopy, Low Energy Electron Diffraction, 115 KeV X-Ray Pair Distribution Function Spectroscopy

A.) Applied the above techniques to investigate the electronic and geometric structure of plutonium allotropes and alloys with the goals of: I) Determining the electronic (and geometric) structure of plutonium metal (α , δ , and other allotropes); II) Determining the electronic (and geometric) structure of Pu oxide; III) Determining the surface chemistry of plutonium; IV) Integrating of theory with the experimental results.

B.) Applied the above techniques to study radiation damage in MgAl_2O_4 spinels.

C.) Determination of the soft x-ray transitions in silicon based insulators.

D.) Determination of the band structure of a family of planar compounds including MoS_2 .

E.) Investigation of the interactions of Pu solutions with proposed backfill materials for long term storage of nuclear waste and bacteria that are present at proposed sites.

Los Alamos National Laboratory
Post-Doctoral Advisor:
Dr. Roland Schulze
9/97 to 11/98

Photoelectron Spectroscopy, Photoelectron Diffraction, X-Ray Absorption Spectroscopy, Low Energy Electron Diffraction

Applied the above techniques to investigate the oxidation states, bonding, and conformation chemistry of plutonium, in molecular, surface sorbed, and solid forms with the goals of: I) Determining the oxidation states of plutonium in molecular solids using photoelectron spectroscopy; II) Studying the interactions of these molecular compounds with well characterized model environmental surfaces by performing sorption reactions under controlled conditions from solution or gas phase; III) Examining samples from the Source Term Test Program (STTP), the large scale experiment in which Pu-bearing actinide waste has been added to liter and 55-gallon drum vessels containing brines and waste matrix materials.

Northwestern University
Post-Doctoral Advisor:
Prof. Michael J. Bedzyk
12/96 to 9/97

X-Ray Standing Waves Spectroscopy

Applied the above technique to the study of semiconductor surfaces and single-crystal oxide surfaces.

Stanford University
Doctoral Advisor:
Prof. Piero Pianetta
Co-advisor:
Prof. Edward I. Solomon
06/91 to 11/96

Photoelectron Spectroscopy, Photoelectron Diffraction, X-Ray Absorption Spectroscopy, Low Energy Electron Diffraction

Applied the above techniques to the study of Hydrogen-, Halogen-, and Alkyl-terminated silicon surfaces and single-crystal metal oxides. Designed and built an electron energy analyzer control unit out of individual power supplies to replace a HAC 5000 control unit for a VSW 100 mm hemispherical analyzer. Designed and wrote control software for the control unit using Labview.

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Stanford University
Doctoral Advisor:
Prof. Steven M. George
09/90 to 06/91

Laser Induced Thermal Desorption, Temperature Programmed Desorption, Auger Electron Spectroscopy, Low Energy Electron Diffraction

Applied the above techniques to the study of adsorbates on single-crystal metal oxides.

University of Chicago
Undergraduate Advisor:
Prof. Laurie J. Butler
10/88 to 06/90

Crossed Laser-Molecular Beam Photodissociation

Assembled rotatable source, crossed laser-molecular beam apparatus. Simulated ion beam optics to focus ionized molecular fragments into a mass spectrometer using the program SimIon. Designed vacuum compatible electronics to trigger the data acquisition system to acquire data when activated by a light pulse through a chopper wheel.

Honors and Awards

1999 Los Alamos
National Laboratory
Los Alamos, New Mexico,
September, 1999

Science and Technology Award Recipient

Presentation Title: The Electronic Structure of Plutonium.

1995 International Chemical
Congress of Pacific
Basin Societies
Honolulu, Hawaii, December, 1995

Awarded Student Prize in Physical Chemistry

Presentation Title: Characterization of Alkyl-Terminated Silicon(111) Surfaces.

Appointed to the Education
Committee of the Northern
California Chapter of the
American Vacuum Society
August, 1994 to May, 1996

Educating Educators Subcommittee Chairperson

Set up a subcommittee to distribute vacuum technology into local school systems. Designed and implemented a program in which elementary school scientists perform vacuum experiments. Performed demonstrations at Science Nights in local schools.

NSF Graduate Fellowship
1990

Honorable Mention

Professional Duties

Scientific Directions at the
Advanced Light Source
Workshop Attendee
Berkeley, California, March 1998

Molecular Environmental Science Working Group

Actinide Environmental Science Subgroup

Actinide Safety Review
Committee at the
Advanced Light Source
Berkeley, California
January 1999 - present

Reviews All Actinide Proposals

This group sets safety requirements for all experiments involving radioactive materials at the Advanced Light Source.

Teaching Experience

Instructor <i>Illinois Institute of Technology, August-December, 2001</i>	<i>BCPS 321: Instrumental Methods of Analysis</i> Taught Instrumental Methods Lecture and Laboratory Course.
Instructor <i>University of Missouri, Columbia, July 2001</i>	<i>Nuclear Engineering 310: X-ray Absorption Applications to Engineering</i> Summer Course: Taught course on Extended X-ray Absorption Spectroscopy and its application to engineering problems.
Guest Lecturer	<i>Diffraction Studies in Materials Science</i> Taught the technique of Extended X-ray Absorption Spectroscopy.
Teaching Assistant	<i>Undergraduate Quantum Chemistry</i> <i>Undergraduate Physical Chemistry Laboratory I</i> <i>Undergraduate Physical Chemistry Laboratory II</i> <i>Undergraduate General Chemistry</i> <i>Electronic Structure of Solids</i> <i>Solid State Physics</i> Graded homework and exams. Conducted review sessions. Rewrote electronics laboratory handbook.

Presentations

2000 International Chemical Congress of Pacific Basin Societies <i>Honolulu, Hawaii, December 15, 2000</i>	<i>Recent Advances in Actinide EXAFS</i> Presented structural data from plutonium alloys with varying Ga concentrations was also shown. Principal component analysis of EXAFS data was highlighted. The use of a bent Laue detector to separate actinide x-ray spectra from multicomponent samples was described.
Physics Department Colloquium University of Toledo <i>Toledo, Ohio, October 24-25, 2000 (invited)</i>	<i>Spin and Orbital Magnetism in 5f Materials</i> Presented the 5d-5f resonant photoemission of metallic plutonium. A band-like behavior with remnant multiplet structure was observed.
Biological Chemical and Physical Sciences Seminar Illinois Institute of Technology <i>Chicago, Illinois, September 24, 2000 (invited)</i>	<i>Synchrotron Radiation Investigations of Actinides and Radiation Damage</i> Presented 5d-5f resonant photoemission data suggesting the partial localization of 5f valence electrons in δ -plutonium. Structural data from alloys with varying Ga concentrations was also shown. Principal component analysis of EXAFS data was highlighted. EXAFS data on ion-irradiated Spinel was shown to illustrate the short range effects of damage.

Jeff Terry

**Radiochemistry/Nuclear
Engineering Seminar
University of Missouri**
Columbia, Missouri,
April 24-25, 2000
(invited)

Synchrotron Radiation Investigations of Actinides and Radiation Damage

Presented 5d-5f resonant photoemission data suggesting the partial localization of 5f valence electrons in δ -plutonium. Structural data from alloys with varying Ga concentrations was also shown. Principal component analysis of EXAFS data was highlighted. EXAFS data on ion-irradiated Spinel was shown to illustrate the short range effects of damage.

BESSRC CAT 2000 Workshop
Argonne, Illinois,
April 7, 2000
(invited)

Principal Component Analysis of X-ray Absorption Spectra from Pu Alloys

Presented structural data from plutonium alloys with varying Ga concentrations was also shown. Principal component analysis of EXAFS data was highlighted.

**American Physical Society
March Meeting 2000**
Minneapolis, Illinois,
March, 2000
(invited replacement
for G. van der Laan)

Spin and Orbital Magnetism in 5f Materials

Presented the 5d-5f resonant photoemission of metallic plutonium. A band-like behavior with remnant multiplet structure was observed.

**Materials Engineering Seminar
Colorado School of Mines**
Golden, Colorado,
March 2, 2000
(invited)

Electronic and Geometric Structure of Pu Alloys

Presented numerous examples of the types of work done on actinides at a synchrotron radiation facility. Including highlights of the "hot" facilities now available at the Advanced Light Source (Berkeley, CA) and at the Advanced Photon Source (Argonne, IL).

**Inorganic Chemistry Seminar
Florida State University**
Tallahassee, Florida,
February 10-11, 2000
(invited)

Synchrotron Radiation Investigations of Plutonium Alloys and Compounds

Presented 5d-5f resonant photoemission data suggesting the partial localization of 5f valence electrons in δ -plutonium. Structural data from alloys with varying Ga concentrations was also shown. Principal component analysis of EXAFS data was highlighted.

Rare Earth Research Conference
Chicago, Illinois,
July, 1999

Electronic and Geometric Structure of Pu Alloys

Presented numerous examples of the types of work done on actinides at a synchrotron radiation facility. Including highlights of the "hot" facilities now available at the Advanced Light Source (Berkeley, CA) and at the Advanced Photon Source (Argonne, IL).

**Nuclear Materials and
Technology Division Review**
Los Alamos, New Mexico,
May, 1999
(invited)

Electronic Structure of Pu Metal Allotropes

Presented core level photoemission, 5d-5f resonant photoemission, and $O_{4,5}$ X-ray absorption data from Pu allotropes.

**American Vacuum Society (NM)
35th Annual Symposium**
Albuquerque, New Mexico,
April, 1999
(invited)

Introduction to Synchrotron Radiation

Presented numerous examples of the types of work done at a synchrotron radiation facility. Examples highlighted real world applications of synchrotron based techniques.

**International Conference
on Spectromicroscopy**
Stoughton, Wisconsin,
October, 1998

Synchrotron Radiation Studies of Plutonium Compounds

Presented core level photoemission, 5d-5f resonant photoemission, and $O_{4,5}$ X-ray absorption data from Pu oxides and Pu adsorbed on MgO .

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- Doctoral Dissertation Defense**
Stanford University
Stanford, California,
November 21, 1996
- Atomic and Electronic Structures of Novel Silicon Surface Structures*
Presented synchrotron radiation studies of novel silicon surfaces.
- SIRM Meeting Northern California Chapter of the American Vacuum Society**
Stanford, California,
September, 1996
- Application of X-ray Photoelectron Diffraction to Chemically Modified Silicon(111) Surfaces*
Presented scanned-energy photoelectron diffraction data from Methyl- and Pentyl-terminated silicon(111) surfaces.
- First International Conference on Synchrotron Radiation in Materials Science**
Chicago, Illinois,
July-August, 1996
- Measurement of the Electronic Structure of Solids with a Display Spectrometer*
Presented results from valence band mapping studies of C(111) and H-Si(111), highlighting the agreement of the experimental band structures with calculated band dispersion.
- First International Conference on Synchrotron Radiation in Materials Science**
Chicago, Illinois,
July-August, 1996
- Synchrotron Radiation Studies of Chemically Modified Si(111) Surfaces*
Presented scanned-energy photoelectron diffraction, NEXAFS, EXAFS, LEED, and photoemission data from Alkyl-terminated Si(111) and Cl-Si(111).
- Nuclear Materials and Technology Division Seminar**
Los Alamos National Laboratory
Los Alamos, New Mexico,
June 28, 1996
(invited)
- Application of X-ray Photoelectron Diffraction and Extended X-ray Absorption Fine Structure Spectroscopy to Chemically Modified Silicon(111) Surfaces*
Presented characterization data of the intermediate stages, H-Si(111), Cl-Si(111), and H₃C-Si(111), in the preparation of Methyl-terminated Si(111).
- Solid State Physics Seminar**
University of Wisconsin, Madison
Madison, Wisconsin,
April 11, 1996
(invited)
- Characterization of Pentyl-Terminated Si(111) Using Synchrotron Radiation*
Presented scanned-energy photoelectron diffraction, NEXAFS, and photoemission data from Pentyl-terminated Si(111).
- 1995 International Chemical Congress of Pacific Basin Societies**
Honolulu, Hawaii,
December, 1995
- Characterization of Alkyl-Terminated Silicon(111) Surfaces*
Presented scanned-energy photoelectron diffraction data from Methyl- and Pentyl-terminated silicon(111) surfaces.
- 40th National Symposium of the American Vacuum Society**
Orlando, Florida,
November, 1993
- Photoemission study of Au, Ge, and O₂ deposition on NH₄F etched Si(111)*
Presented photoemission data from surface overlayers deposited on Hydrogen-terminated silicon(111) surfaces.
- 39th National Symposium of the American Vacuum Society**
Chicago, Illinois,
November, 1992
- Near Edge X-Ray Absorption of Light Emitting Porous Silicon*
Presented NEXAFS data from anodically etched porous silicon.

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**Chemical Surface Preparation,
Passivation and Cleaning for
Semiconductor Growth
and Processing Symposium
Materials Research Society
San Francisco, California,
April, 1992**

A Photoemission Study of Electrochemically Etched Light Emitting Silicon.

Presented photoemission data from anodically etched porous silicon.

Publications

**Leyarovska, N., M. Soler,
G. Christou, and J. Terry**

The Effect of Ligands on the Unoccupied Density of States in Mn_{12} Acetate Molecular Magnets: An X-Ray Absorption Near-Edge Structure Study. (In preparation).

**Leyarovska, N., M. Soler,
G. Christou, and J. Terry**

An X-ray Absorption Study of Mn_{12} Acetate. (In preparation).

**Terry, J., R. K. Schulze,
L. Soderholm, M. Antonio,
and S. Wasserman**

Principal Component Analysis: Local Structure of Pu Alloys from Extended X-ray Absorption Spectroscopy. (In Preparation).

**J. D. Farr, J. Terry, R. K. Schulze,
M. Neu, L. Morales,
L. Soderholm, M. Antonio,
and S. Wasserman**

Plutonium(IV) Adsorption onto Natural Brucite. (In Preparation).

**Terry, J., R. K. Schulze,
K. Sickafus, I. Afanasyev,
J. Valdez, and J. Wills**

Utilization of X-ray Absorption to Determine Local Atomic Structure in Xe-Irradiated Spinel. (In Preparation).

**Van Buuren, T., J. Terry,
R. K. Schulze,
and L. J. Terminello**

Band Structure Measurements of MoS_2 with a Display Analyzer. (Under Review).

**Van Buuren, T., J. Terry,
R. K. Schulze,
and L. J. Terminello**

Resonant Inelastic X-ray Scattering on Si_3N_4 , SiO_2 and SiC. (Under Review).

**Tobin, J. G., B. W. Chung,
G. D. Waddill, R. K. Schulze,
J. Terry, J. D. Farr, T. Zocco,
D. K. Shuh, E. Rotenberg,
K. Heinzelman, G. Van der Laan,**

Resonant photoemission in f-electron systems: Pu and Gd. (Submitted Physical Review B).

**Terry, J., R. K. Schulze,
J. D. Farr, T. Zocco,
K. Heinzelman, E. Rotenberg,
D. K. Shuh, G. Van der Laan,
D. A. Arena and J. G. Tobin**

5f Resonant photoemission from plutonium . Surface Science, 2002, vol. 499, p. L141.

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- Espinosa, F. J., P. Vilella,
J. C. Lashley, S. D. Conradson,
L. E. Cox, R. Martinez,
B. Martinez, L. Morales,
J. Terry, and R. A. Pereyra
- Local Atomic Structure in α -Plutonium Alloys.* Physical Review B, 2001, vol 63. p. 17411.
- Terry, J., R. K. Schulze,
J. Lashley, T. Zocco, J. D. Farr,
E. Rotenberg, K. Heinzelman,
D. K. Shuh, M. Blau and J. Tobin
- Photoemission Studies at the Advanced Light Source Shed Light on Plutonium Phase Characteristics.* Actinide Research Quarterly, 1999, p. 1.
- Terry, J., C. Wigren, M. R. Linford, R. Cao, C. E. D. Chidsey, and P. Pianetta
- Electronic structure of alkyl monolayers on Si(111).* Journal of Applied Physics, 1999, vol. 85, no. 1, p. 213.
- Terry, J., R. Mo, C. Wigren, R. Cao, G. Mount, P. Pianetta, M. R. Linford, and C. E. D. Chidsey
- Reactivity of the H-Si(111) Surface.* Nuclear Instruments & Methods in Physics Research, Section B (Beam Interactions with Materials and Atoms), 1997, vol.133, no.1-4, p.94.
- Terry, J., M. R. Linford, C. Wigren, R. Cao, P. Pianetta, and C. E. D. Chidsey
- Determination of the bonding of alkyl monolayers to the Si(111) surface using chemical-shift, scanned-energy photoelectron diffraction.* Applied Physics Letters, 1997, vol.71, no.8, p.1056.
- Terry, J.
- Atomic and Electronic Structures of Novel Silicon Surface Structures.*, Ph.D. Thesis, SLAC Report # 514, Department of Chemistry, Stanford University, March, 1997.
- Terry, J., R. Cao, C. Wigren, and P. Pianetta
- Photoemission study of Au, Ge, and O₂ deposition on NH₄F etched Si(111).* Journal of Vacuum Science & Technology A (Vacuum, Surfaces, and Films), 1994, vol.12, no.4, pt.2: p. 1869.
- Yang, X., R. Cao, J. Li, J. Terry, J. Wu, and P. Pianetta
- The epitaxial growth of Ge on Si(100) using Te as a surfactant.* Common Themes and Mechanisms of Epitaxial Growth Symposium, P. Fuoss, editor, *et al.*, 1993, Pittsburgh, PA, USA: Mater. Res. Soc. p. 243.
- Terry, J., H. Liu, R. Cao, J.C. Woicik, P. Pianetta, X. Yang, J. Wu, M. Richter, N. Maluf, F. Pease, A. Dillon, M. Robinson, and S. George
- A photoemission study of electrochemically etched light emitting silicon.* Chemical Surface Preparation, Passivation and Cleaning for Semiconductor Growth and Processing Symposium, R.J. Nemanich, editor, *et al.*, 1992, Pittsburgh, PA, USA: Mater. Res. Soc. p. 421.
- Cao, R., X. Yang, J. Terry, and P. Pianetta
- Core-level shifts of the Ge(100)-(2*1) surface and their origins.* Physical Review B (Condensed Matter), 1992, vol.45, no.23: p. 13749.
- Wu, J., M. Richter, R. Cao, J. Terry, P. Pianetta, and I. Lindau
- Antimony on diamond: a comparison to Sb/Si and Sb/Ge.* Novel Forms of Carbon Symposium, C.L. Renschler, editor, J.J. Pouch, editor, and D.M. Cox, editor., 1992, Pittsburgh, PA, USA: Mater. Res. Soc. p. 407.

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**Wu, J., Z.-X. Shen, D.S. Dessau,
R. Cao, D.S. Marshall,
P. Pianetta, I. Lindau, X. Yang,
J. Terry, D.M. King, B.O. Wells,
D. Elloway, H.R. Wendt,
C.A. Brown, H. Hunziker,
and M.S. de Vries**

Electronic structure of single crystal C₆₀. Physica C, 1992, vol.197, no.3-4: p. 251.

**Yang, X., R. Cao, J. Terry,
and P. Pianetta**

Photoemission study of the Si, Ge epitaxial growth process using surfactants. Chemical Surface Preparation, Passivation and Cleaning for Semiconductor Growth and Processing Symposium, R.J. Nemanich, editor, *et al.*, 1992, Pittsburgh, PA, USA: Mater. Res. Soc. p. 455.

**Wu, J., Z.-X. Shen, D.S. Dessau,
R. Cao, D.S. Marshall,
P. Pianetta, I. Lindau, X. Yang,
J. Terry, D.M. King,
and B.O. Wells**

Photoemission study of single crystal C₆₀. Novel Forms of Carbon Symposium, C.L. Renschler, editor, J.J. Pouch, editor, and D.M. Cox, editor, 1992, Pittsburgh, PA, USA: Mater. Res. Soc. p. 235.

**Cao, R., X. Yang, J. Terry,
and P. Pianetta**

Microscopic study of the surfactant-assisted Si, Ge epitaxial growth. Applied Physics Letters, 1992. vol.61, no.19: p. 2347.

**Yang, X., R. Cao, J. Terry,
and P. Pianetta**

Si(100) and Ge(100) core-level shifts: a reevaluation. Journal of Vacuum Science & Technology B (Microelectronics Processing and Phenomena), 1992, vol.10, no.4: p. 2013.

Participating Research Teams (PRT)

**Molecular Environmental
Science PRT at the
Advanced Light Source
Berkeley, California,
Funded April, 1999**

Associate Core Member

This PRT was funded to build a 50-1500 eV Beam line at the Advanced Light Source by FY 2003. It was funded with a Basic Energy Sciences Grant for \$6M. As a member of the PRT, I will receive dedicated experimental time for the first 3 years of commissioning and the first 3 years of operation.

Memberships

American Vacuum Society

American Chemical Society

American Physical Society

References

Prof. Piero Pianetta Stanford Synchrotron Radiation Laboratory
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Others Available on Request

Jeff Terry